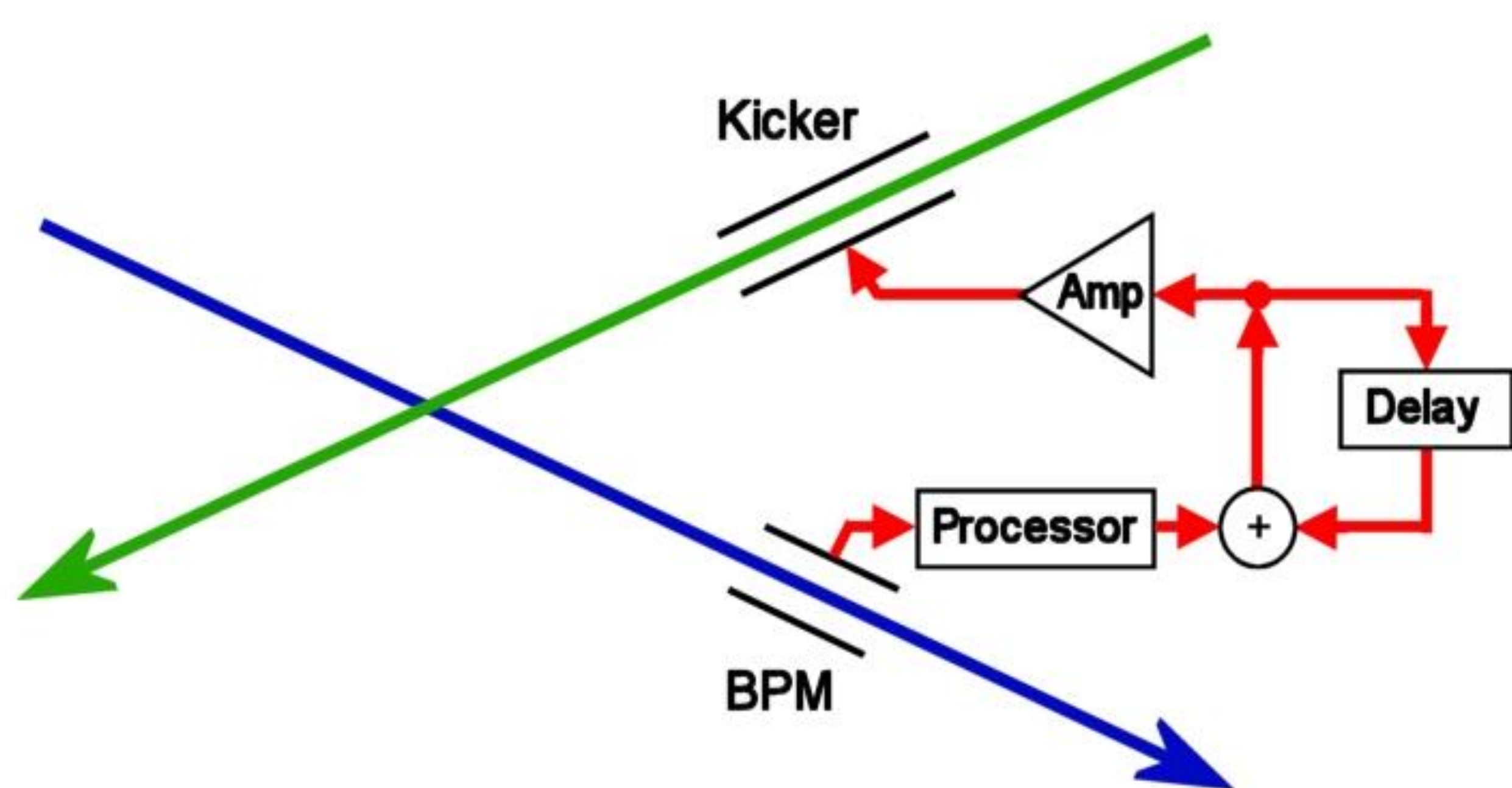


Development of a fast, single-pass, micron-resolution beam position monitor signal processor: beam test results from ATF2

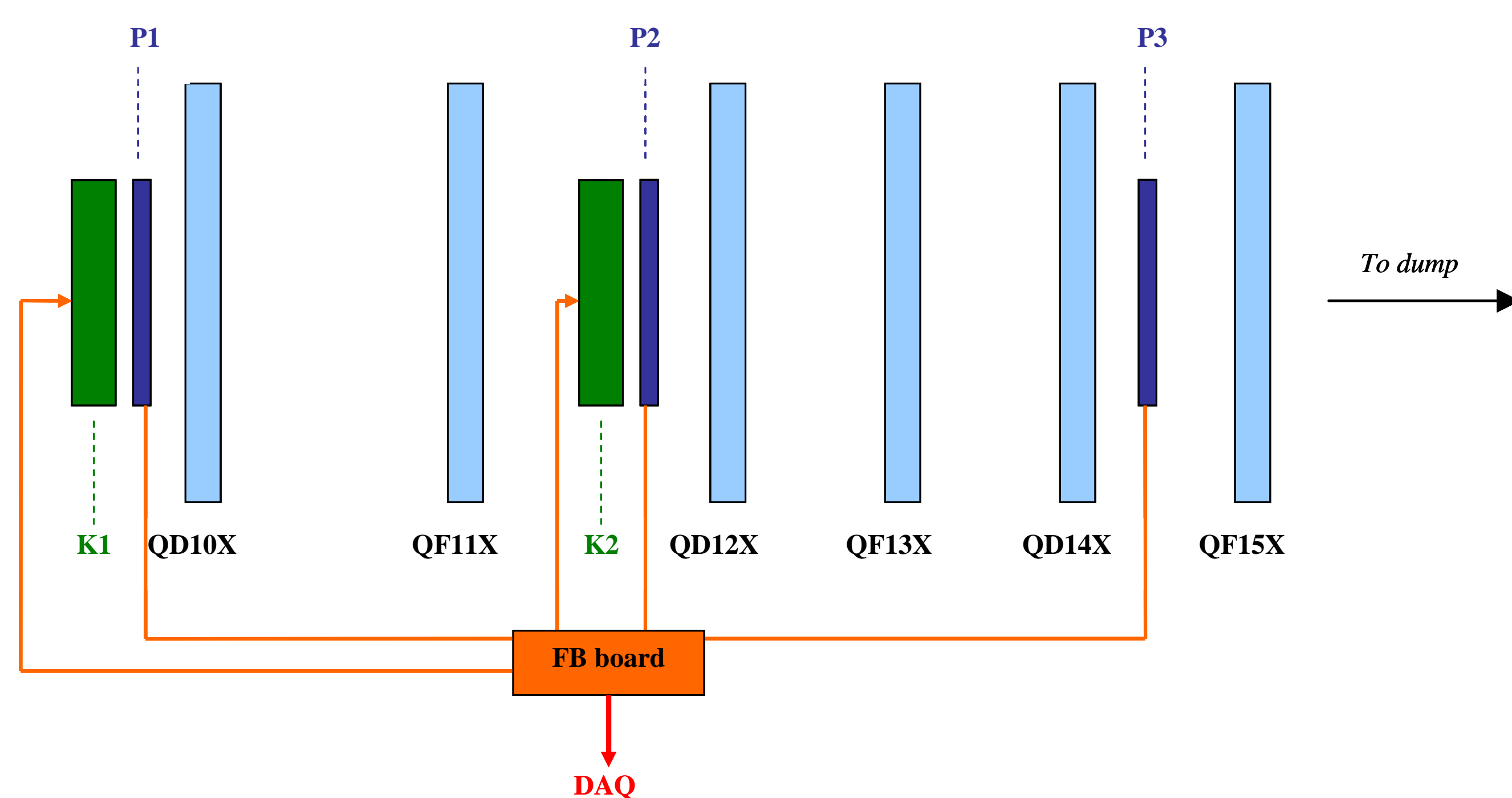
R. Apsimon, D. Bett, P.N. Burrows, G.B. Christian, B. Constance, H. Dabiri Khah, C. Perry, J. Resta Lopez, C. Swinson
(John Adams Institute, Oxford University, UK)

Linear Collider intra-train IP feedback concept:

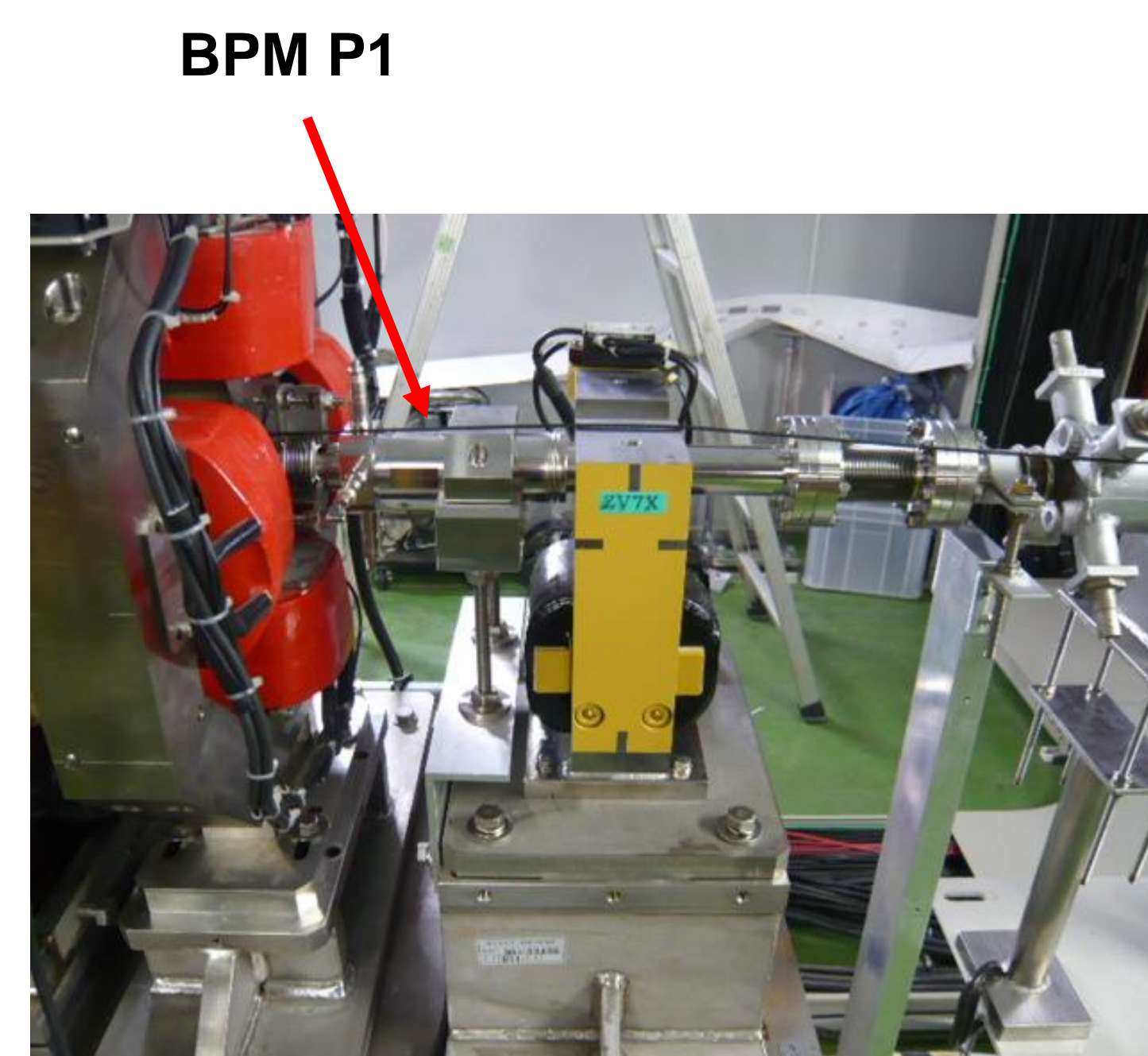


Detect position offset of incoming bunches early in train. Calculate correction and apply with kicker to later bunches

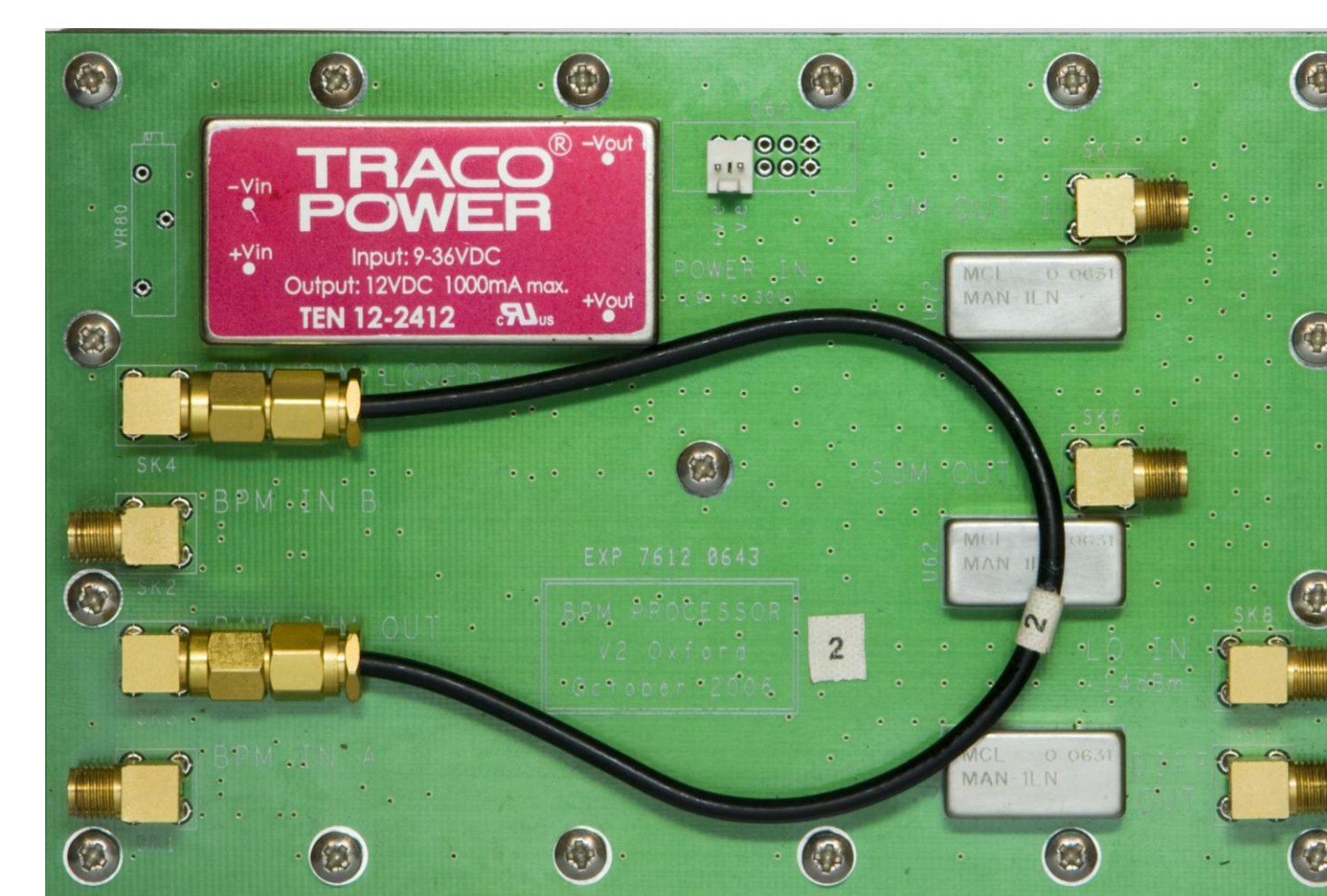
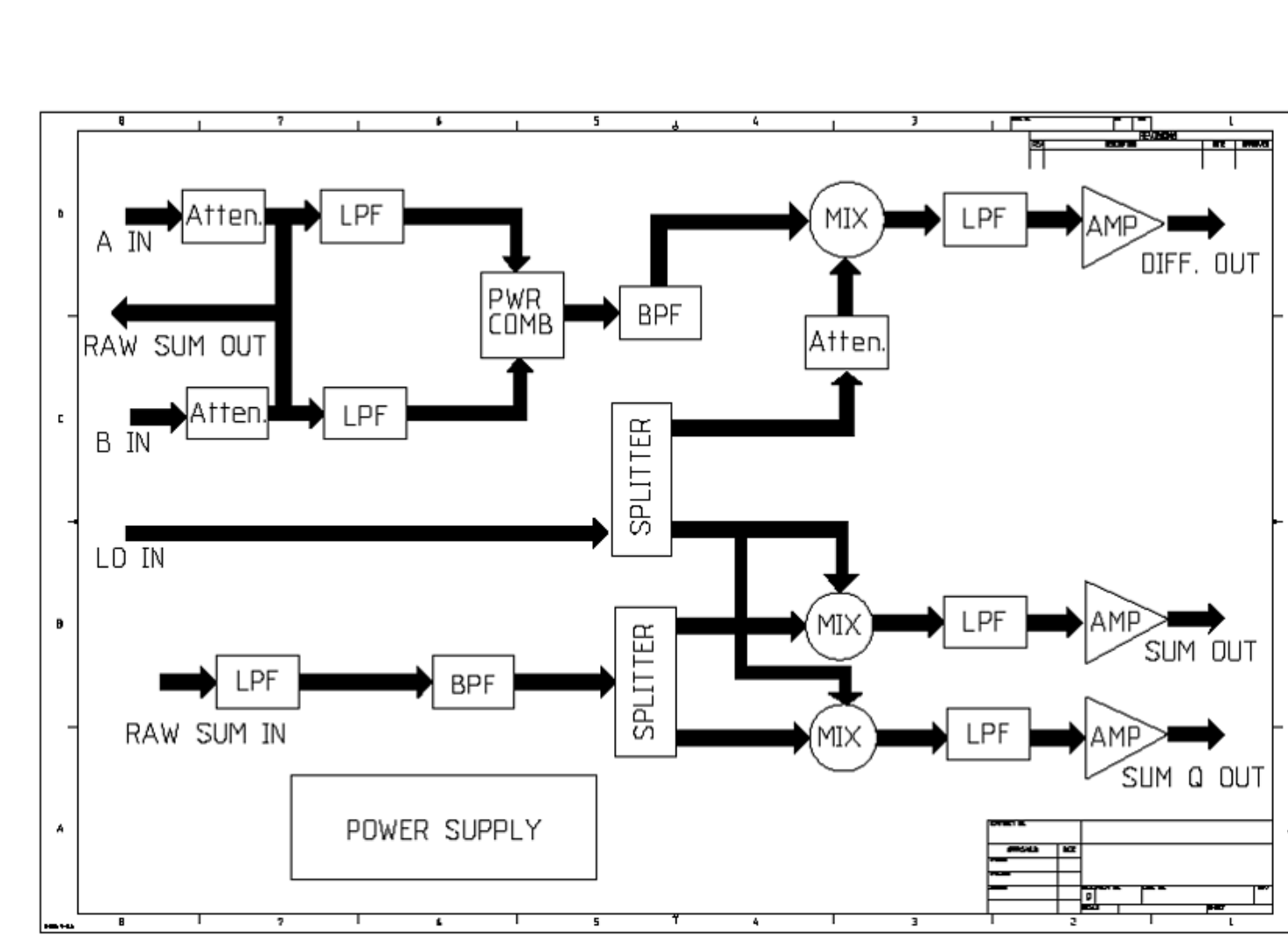
FONT5 digital prototype beam feedback at KEK ATF2:



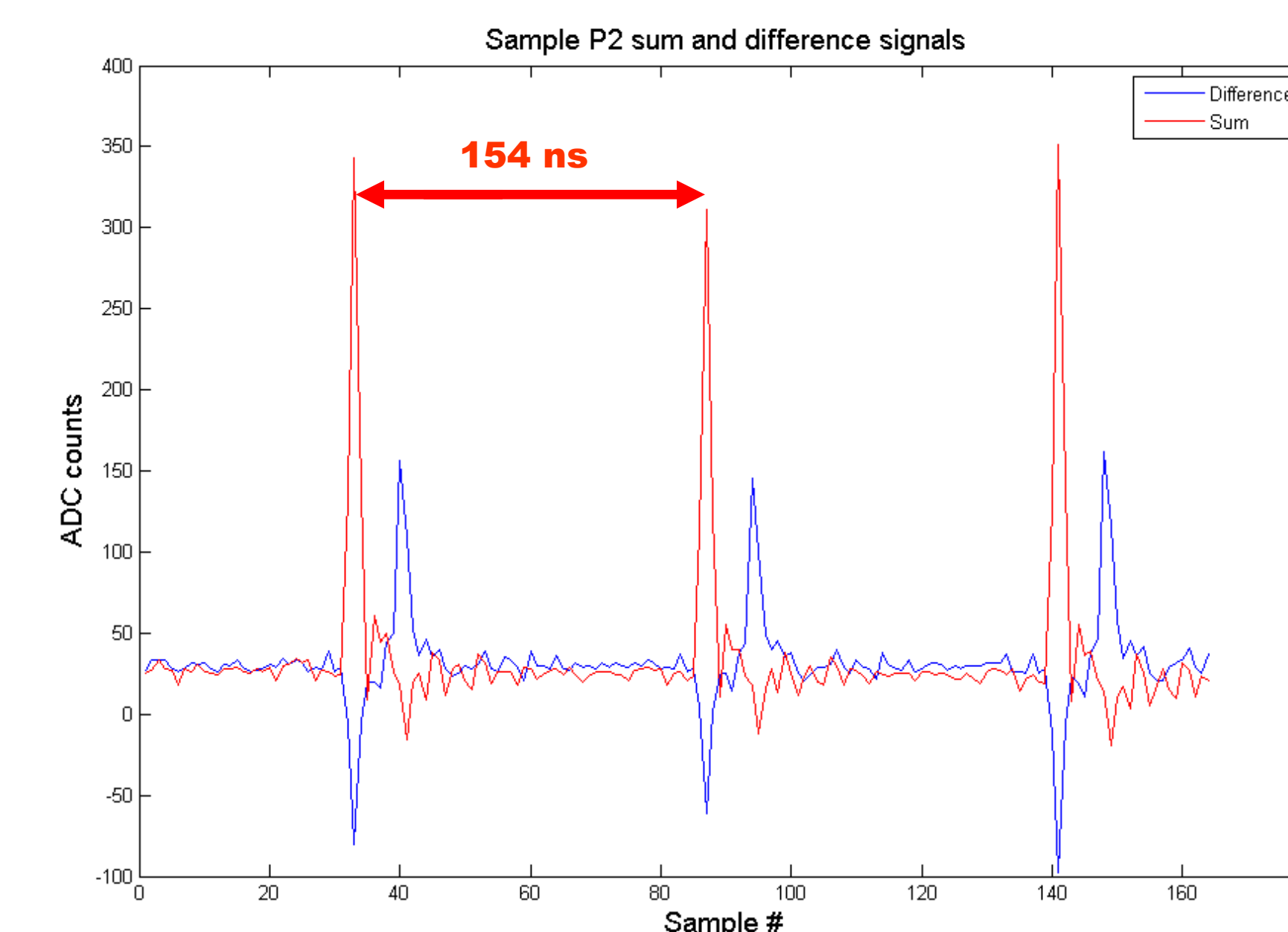
ATF2 extraction line:



Front-end analogue processor:

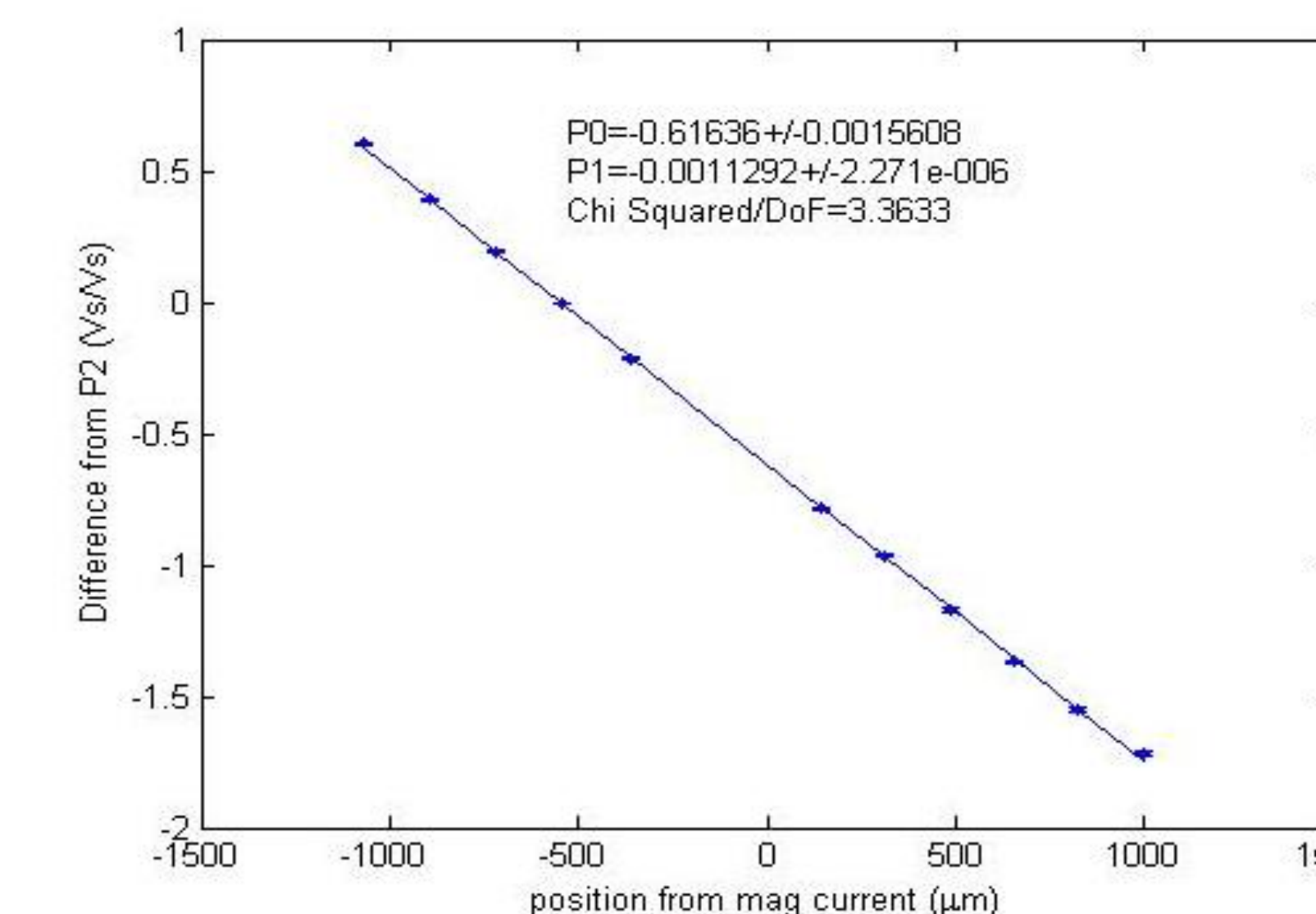


Multibunch time resolution:



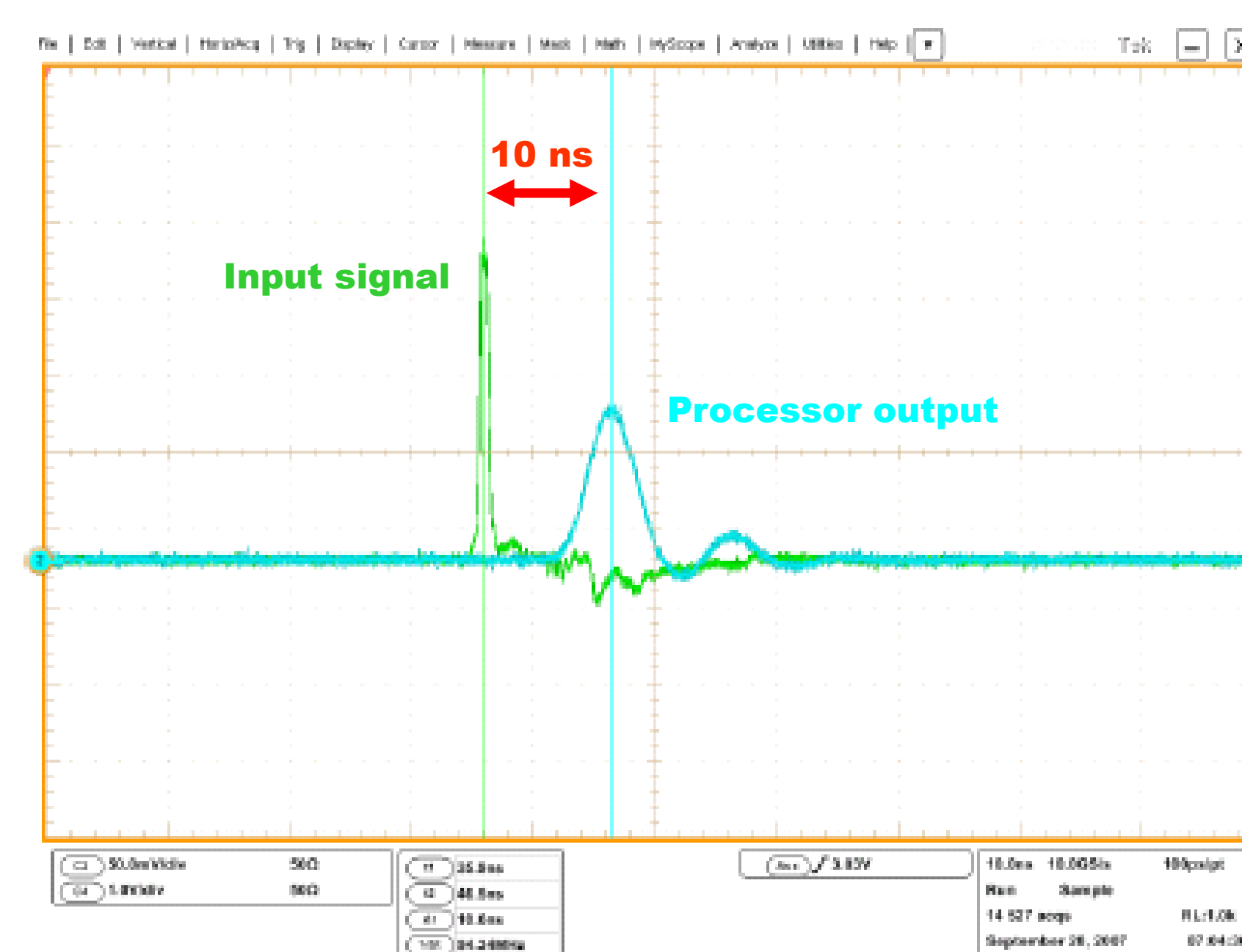
Example sum (red) and difference (blue) signals showing 3 bunches, for a near zero position in BPM P2.

Position calibration:



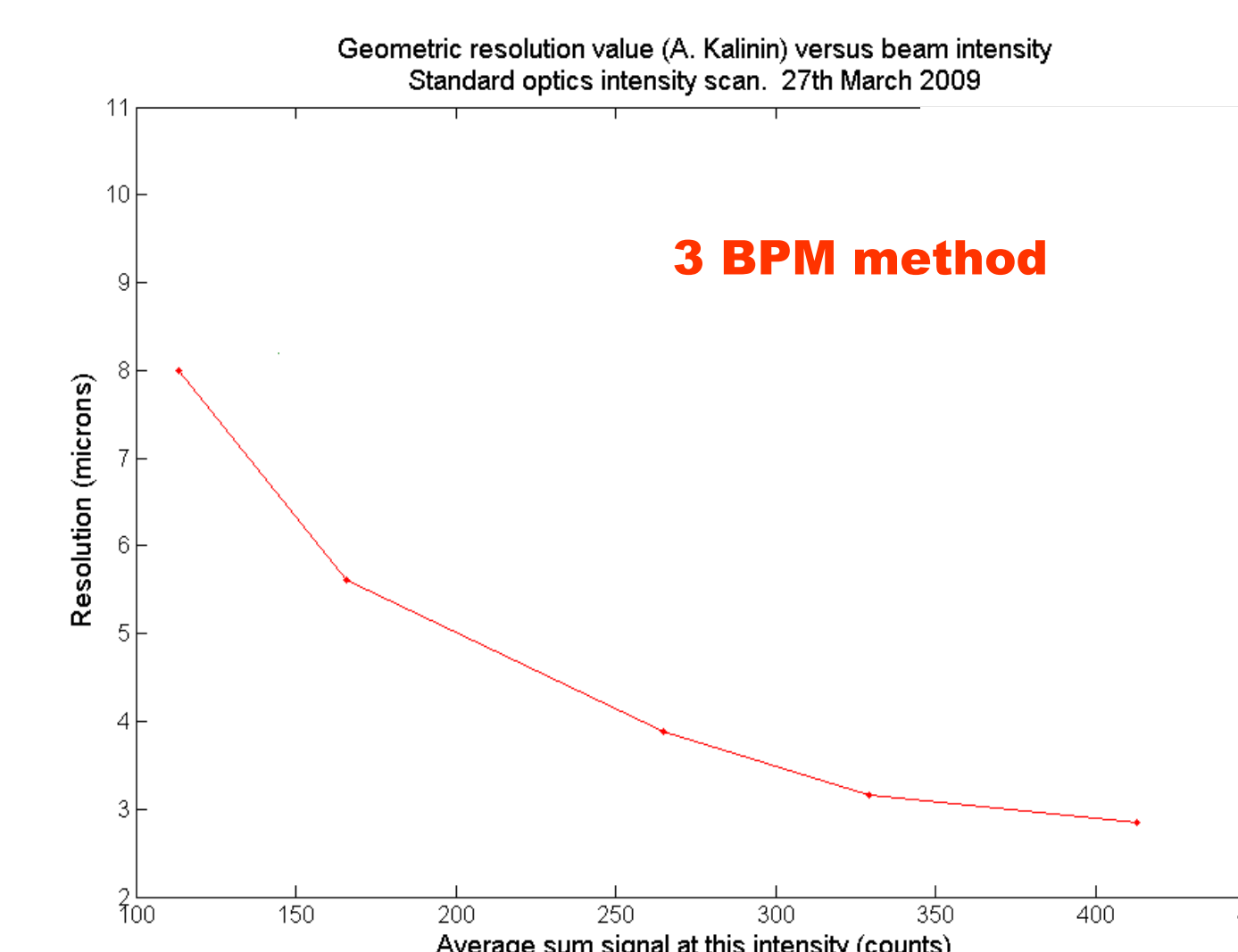
Example BPM calibration: ratio of digitised difference and sum signals vs. position (microns) determined using a corrector (arbitrary zero).

Latency measurement:

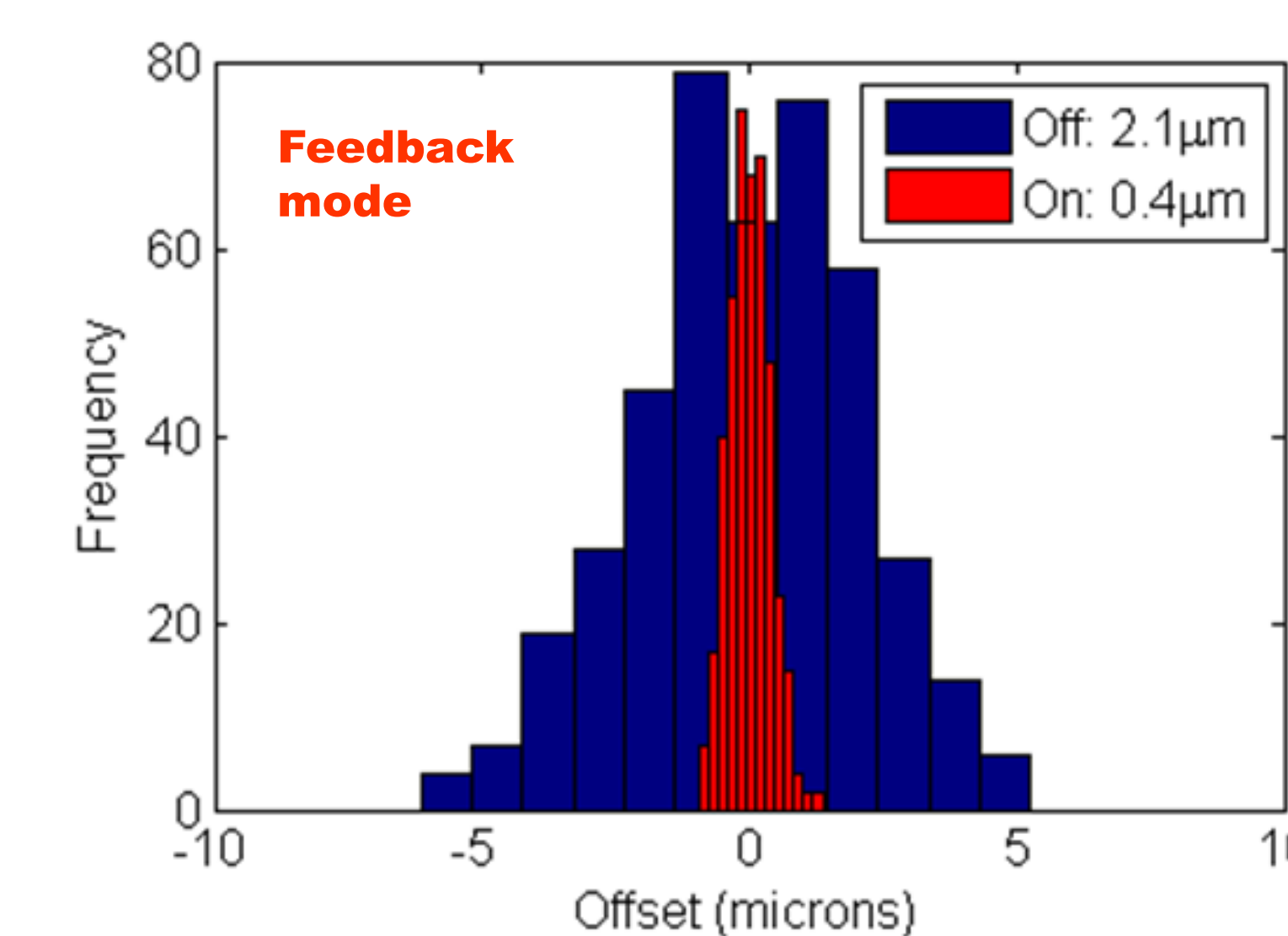


Latency ~ 10 ns

Position resolution:



BPM resolution (microns) vs. bunch charge (ADC counts). 100 counts is equivalent to approximately 1×10^9 electrons.



Distribution of vertical beam position at P2 for bunch 2 without (blue) and with (red) feedback. A rolling average is subtracted from each bunch position to remove the effects of position drift from the jitter distributions.